Small Business Innovation Research/Small Business Tech Transfer

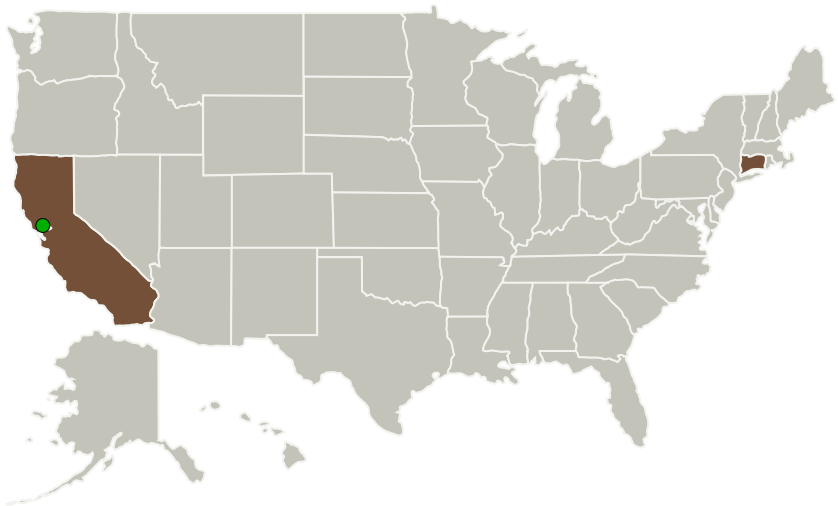
Diagnosis-Driven Prognosis for Decision Making, Phase I

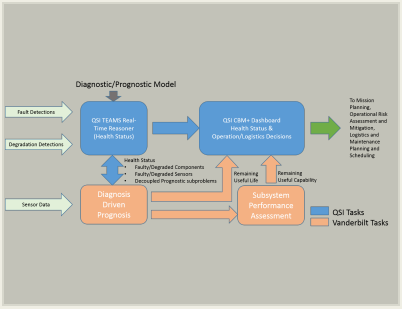
Completed Technology Project (2014 - 2014)

Project Introduction

One cannot build a system-level Prognosis and Health Management (PHM) solution by cobbling together a bunch of existing prognostic techniques; it will have a very high rate of false-positive indications. On the other hand, if a system-level health management solution could identify the individual degradations and indictors associated with those degradations, and thereby decouple the problem into smaller pieces, the existing prognostic techniques could still be used to predict time to failure, and could therefore drive an effective Condition Based Maintenance and Decision Support System (CBM+). Qualtech Systems, Inc. (QSI) and Vanderbilt University team seeks to develop a system-level diagnostic and prognostic process and a "sense and respond capability" which first uses error codes and discrete sensor values to correctly diagnose the system health including degradations and failures of sensors and components, and then invoke appropriate prognostic routines for assessment of remaining life and capability. Thus, QSI's Testability Engineering And Maintenance System (TEAMS) real-time reasoner will enable the use of many existing prognostics techniques in the broader context by decomposing the complex system into local datasets of degradations and associated sensor data sets, thereby limiting the problem-space for the prognostic techniques to their limited design scope. Indeed, it is well established in the contexts of parameter estimation and model-based fault identification (i.e., fault isolation and severity estimation) that feature selection and diagnosis, respectively, followed by parameter estimation provides major improvements in estimation performance (measured in terms of computational time as well as the standard deviations of the estimated parameters) when compared to full parameter estimation which provides biased estimates for all the parameters.

Primary U.S. Work Locations and Key Partners





Diagnosis-Driven Prognosis for Decision Making Project Image

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Organizations Performing Work	Role	Type	Location
Qualtech Systems, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Rocky Hill, Connecticut
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Connecticut

Project Transitions

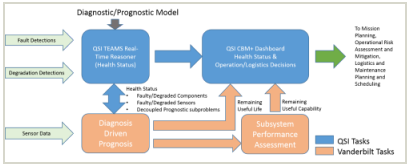
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140495)*

Images



Project Image
Diagnosis-Driven Prognosis for Decision Making Project Image *(https://techport.nasa.gov/image/131068)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Qualtech Systems, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

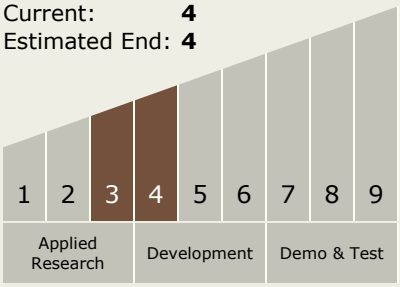
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Somnath Deb

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Diagnosis-Driven Prognosis for Decision Making, Phase I

Completed Technology Project (2014 - 2014)

Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.1 Infrastructure Optimization
    - TX13.1.2 Launch/Test/Ops Site Management

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System